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(54) CLOSURE FOR LIQUID CONTAINERS

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No. OF CLAIMS 5

Field of the Invention

This invention relates to a closure for liquid containers, especially a closure which can be pierced by a hollow tube through which liquid may be drawn from within the container under the influence of gas pressure acting against the liquid, the gas pressure having been communicated to the interior of the container from a source of pressurized gas external thereto. In particular, the present invention is related to a closure for use with beverage containers, such as those in which soft drinks or beer may be sold.

Background of the Invention

Recently, it has been found desirable by manufacturers of beverages - especially brewers of beer and ale, and the like - to offer for sale to the public containers having the manufactured beverage therein; being the sort of containers from which the beverage therein may be drawn under the influence of gas pressure from a source of pressurized gas external to the container. Such containers, for example, may be of the sort containing several quarts to a gallon or more of beverage. Small tapping units have been offered for sale in the market, thereby making an inexpensive and easily portable source of such beverages as draft beer available through ordinary retail outlets in which such beverages would normally be sold. However, it has been necessary to provide a suitable closure for the container so that after the beverage is placed therein, the container may be closed with the closure in substantially gas-tight and liquid-tight fashion until such time as the closure itself is pierced for the purposes of withdrawing the liquid from within the container. Thus, the closure must be such as to maintain the substantially gas and

liquid-tight seal between itself and the opening in the disclosure within which the closure is fitted, so as to preserve and assure the shelf life of the beverage for a reasonable period of time. Likewise, the closure must be such that, when it has been pierced by a hollow tube through which the liquid beverage is to be withdrawn from the interior of the container, it must maintain a substantially gas and liquid-tight seal around the hollow tube for as long as the tube remains extending through the closure. It is not suggested, however, by this invention that the tube may be withdrawn from the piercing relationship with the closure and that the closure continue to maintain a gas and liquid-tight seal with respect to the interior of the disclosure; because the closure will have been ruptured by the hollow tube and the place where the rupture has taken place by the piercing action of the hollow tube would not normally reseal to maintain a gas or liquid seal. Thus, the closure which is contemplated by the present invention is intended to be used but once, in terms of its use after it has been pierced by a hollow tube.

The present invention, however, provides a closure which is such that it will maintain the substantially gas and liquid-tight seal formed between it and the opening in the container in which it is fitted under the influence or exertion against the closure of gas pressures from within the container. Likewise, the closure of the present invention is such that it will not deform sufficiently as to be pushed inwardly into the container while it is being pierced; nor will it lose its sealing relationship both with respect to the opening in the container and the tube extending therethrough.

A preferred embodiment of a common tapping device which is marketed for use with containers having a closure of the sort described herein is such that gas pressure is communicated to within the container from a source of pressurized gas within the tapping device. Thus, the present invention provides a formation for the closure contemplated herein such that, in its preferred embodiment, a gas pressure chamber may be formed above the gasket portion of the closure and be maintained by the formation of the closure and because of the deformability of the material thereof.

Brief Summary of the Invention

It is an object of this invention to provide a closure for liquid containers such as those containing beverages from which the beverage is to be withdrawn through a hollow tube extending through the closure; where the liquid within the container is acted against by a gas pressure within the container and communicated thereto from a source of pressurized gas external to the container.

A further object of this invention is to provide a closure for liquid containers such as aforesaid; where the closure is formed so that it will withstand pressures exerted against it either from within the container or towards the interior of the container.

A still further object of this invention is to provide a closure as aforesaid; where the closure has a formation such as to effectively preclude the probability of the closure being sufficiently deformed as to be forced through the opening of the container in which it is fitted into the interior of the container.

Brief Description of the Drawings

These and other features and objects of the drawings are more clearly discussed hereafter, in association with the accompanying drawings in which:

Figure 1 is a partial perspective view showing a closure according to this invention fitted to a container and having the lower end of a hollow tube in proximity thereto;

Figure 2 is a perspective view to a larger scale of a closure according to this invention, where the closure is subject to forces which cause certain deformation thereof;

Figure 3 is a cross section looking in the direction of arrows 3-3 in Figure 2;

Figure 4 is a cross section looking in the direction of arrows 4-4 in Figure 1; and

Figures 5, 6, 7 and 8 are views similar to Figure 4 but showing a sequence of conditions which exist with respect to the closure during a piercing operation thereof and the placing of a tapping unit into contiguency with the closure for gas communication through the closure to the interior of a container.

Description of the Preferred Embodiments

The following discussion is related particularly to the figures of drawings accompanying this description, in which a preferred commercial embodiment of a closure according to this invention is disclosed. Certain of the figures of the drawings show portions of a tapping unit of a sort which is commercially available and for which certain of the dimensional relationships of the disclosure illustrated in the drawings have been determined. However, the principles of operation

of the closure according to this invention are clearly illustrated in the drawings, and they are referred to hereafter.

A closure 10 is inserted into the top of a container 12. The closure 10 is fitted into an opening defined by the edges 14 - which opening is generally centrally located in the top of the container 12 and of circular configuration. A hollow tube 16 through which liquid from within the container 12 may be withdrawn as discussed hereafter is shown in the figures. In the usual case, the hollow tube 16 is shaped at its bottom end so as to have a face 18 and an extreme point 20 thereof so as to aid in the piercing or rupturing action of the closure, as discussed hereafter.

In general, the closure 10 has a peripheral neck portion 22 whose diameter and top-to-bottom height are such that the peripheral neck portion 22 forms a substantially gas and liquid-tight seal between the closure 10 and the edges 14 of the opening in the top of the container 12. The closure 10 has an upwardly extending channel 24 formed in the underside thereof for communication with the interior of the container 12. The channel 24 is defined by an annular wall 26.

A gasket portion 28 of the closure 10 overlies the upwardly extending channel 24. The gasket portion 28 has a diaphragm portion 30 formed therein; and the thickness of the diaphragm portion 30 is less than the thickness of the gasket portion 28 of the closure 10. A flange 32 surrounds the gasket portion 28 below the upper surface 34 thereof. There is an upwardly extending rim or bead 36 formed on the upper surface of the flange 32.

It has been noted that the diaphragm portion 30 of

the closure 10 is located in the gasket portion 28, and has a thickness less than the gasket portion 28 of the closure 10. In the preferred embodiment, such as that illustrated in the accompanying figures, the diaphragm portion 30 has its upper surface 38 and its lower surface 40 below and above the upper and lower surfaces 34 and 42 respectively of the gasket portion 28. Thus, the gasket portion 30 is, in effect, fixed at its periphery.

It is well known from the theory of beam deflection that when a beam or plate is fixed at its ends or periphery, respectively, the deflection thereof when acted thereon by a constant pressure along the entire length of the beam or across the entire area of the plate is considerably less than would be the deflection of the beam or plate if it were merely supported at its ends or periphery, respectively. Thus, the diaphragm portion 30 may be considered to be a plate where, especially when it is thinner in cross section than the gasket portion 28 of the closure 10 according to this invention, and when its upper and lower surfaces are lower and higher respectively than the upper and lower surfaces of the gasket portion 28, it may be expected that the deflection of the gasket outwardly under the effect of gas pressure generated within the container 12 would be considerably less than if the membrane having the same thickness were placed in the gasket portion 28 so that the top surface 38 of the membrane portion 30 would be in the same plane as the top surface 34 of the gasket portion 28. It should be noted that during certain processing steps - such as the pasturization of ale within a container 12 - gas pressure from the natural carbon dioxide or other gases carried by the liquid

beverage within the container 12 may be exerted and act outwardly against the membrane portion 30 of the closure 10. Such pressures may be in the order of 90 psi or greater. Likewise, pressures of the natural carbon dioxide or other gases carried in the liquid beverage within the container 12 may occur if the container is, for example, inadvertently left exposed to bright sunlight in the interior of a closed automobile in summer time. It is important in such circumstances that the closure 10 be such that it will not rupture at the diaphragm portion 30 thereof, or that it will not lose its liquid and gas-tight seal at the neck portion 22 co-operating with opening 14 of the container 12. The upward deflection of the diaphragm portion 30 of a closure 10 according to this invention, under the pressure of gases within the sealed container 12, is shown in dotted lines at 44 in Figure 4.

It should be noted that it is as a preferred embodiment of the closure 10 according to this invention that the upper and lower surfaces of the diaphragm 30 be lower and higher than the upper and lower surfaces of the gasket portion 28, respectively; especially so as to resist upwardly directed forces against the diaphragm portion 30 when the container 12 is closed but subjected to a heating action. In like manner, however, it is advantageous that the diaphragm portion 30 be substantially as described above and as illustrated in the drawings for purposes of ease of piercing or rupturing the diaphragm portion 30 by the lower end 20 of face 18 of the hollow tube 16, as described below - especially with reference to Figures 4 to 8.

It has been noted that the thickness of the diaphragm portion 30 is less than the thickness of the gasket portion 28

of the closure 10. Thus, the diaphragm portion 30 is more easily pierced or ruptured, particularly by a sharp object such as the chamfered lower end 18 of the hollow tube 16. The piercing action of the lower end of the hollow tube 16 is most particularly enhanced and directed toward the diaphragm portion 30 when the upper surface 38 of the diaphragm 30 is below the upper surface 34 of the gasket portion 28. Thus, in Figure 4, the lower end of the hollow tube 16 is shown in a position immediately adjacent the upper surface 38 of the diaphragm portion 30, and immediately prior to the piercing or rupturing action.

The beginning of the rupturing or piercing action by the hollow tube 16 of the diaphragm portion 30 is illustrated in Figure 5. There, it will be noted that the lower end of the hollow tube 16 has begun to pierce the diaphragm portion 30. In Figure 6, the piercing action has been completed, and the hollow tube 16 is shown extending through the closure 10. There has been some deformation of the inner portions of the gasket 28 and the portions of the diaphragm 30 which immediately surround the hollow tube 16. Nevertheless, especially when the closure 10 is made from a deformable material such as rubber or a rubber-like plastic, a substantially gas and liquid-tight seal is formed around the outer surface of the hollow tube 16 by the material of the gasket portion 30. It should also be noted that the rupturing or piercing of the diaphragm portion 30 does not normally result in the removal of any material therefrom. The hollow tube 16, whose length is approximately equal to the height of the container 12, is pushed downwardly into the container.

It has been mentioned that the hollow tube 16 may

be a portion of a tapping device of the sort which is commercially available, so that the liquid within the container 12 is withdrawn therefrom through the hollow tube 16. In the usual circumstance, the hollow tube 16 is secured within a neck 46 of the lower end of a tapping device 48. Above the neck 46, within the tapping device 48, there is situated suitable valve means to control the flow of the liquid beverage upwards through the hollow tube 16, when the liquid beverage is acted upon by a gas pressure within the container and which is communicated thereto from a source of pressurized gas external to the container. [In the usual circumstance, the source of pressurized gas is a small sealed CO_2 cylinder which is also secured within the commercially available tapping unit. The neck portion 46 of the tapping unit 48 is also adapted to extend downwardly through the closure 10 so as to provide gas communication from the source of pressurized gas to within the container 12, as discussed hereafter.]

It will be noted in Figure 7 that the neck portion 46 extends downwardly through the closure 10, and a substantially gas and liquid-tight seal is formed between the closure 10 and the neck portion 46, except as noted hereafter where provision is made for a slit indicated generally at 50 to provide gas communication from an annular gas pressure chamber indicated generally at 52, particularly as discussed hereafter with reference to Figure 8. It will be appreciated however, that the deformability of the material of the closure 10 provides for the gas and liquid-tight seal; and it should be noted that none of the material of the gasket portion 30 is removed from the closure 10 but the gasket portion 30 is substantially ruptured and deformed so as to permit passage of the neck portion 46 of the tapping unit 48

downwardly through the closure 10 past the gasket portion 28, as indicated in Figures 7 and 8.

A port or channel 54 is formed in the tapping unit 48 to provide gas communication to the annular gas pressure chamber 52 from the source of pressurized gas contained within the tapping unit 48. However, the gas communication through the port 54 is not initiated until after the tapping unit has assumed the position indicated in Figure 8. There, the annular wall 56 which extends downwardly from the tapping unit so as to be spaced from the neck portion 46 and surrounding its upper portion, is brought downwardly sufficiently so as to contact the edges of the gasket portion 28 as at 58. Once again, it will be seen that the material of the closure 10 has been deformed by the downward pressure exerted against it through the annular wall 56; and a substantially gas-tight seal is formed around the gasket portion 28 at the portions of the bottom and inside surfaces of the annular wall 56 which contact the closure. To more easily accommodate the gas-tight sealing relationship between the annular wall 56 and the outer portions of the gasket 28, the gasket may be formed in the manner of a truncated cone and be dimensioned so as to interfere with and be deformed by the annular wall 56 of the tapping unit 48. Thus, the gas pressure chamber 52 is defined above the gasket portion 28 of the closure 10 and within the area defined by the annular wall 56. It can now be seen that gas communication through port 54 to the gas pressure chamber 52, and thence through slit 50 to the upwardly extending channel 24 of the closure 10 provides means whereby gas pressure can be communicated to the interior of the container 12 so as to act against the top surface of the liquid

contained therein to force the liquid up through the hollow tube 16 when the valve (not shown) of the tapping unit 48 is opened.

Figure 3 illustrates an extreme situation when very great force is placed downwardly against the closure 10 as shown at arrow 60. In that case, the top of the container 12 may tend to be deformed downwardly as shown, and the flange 32 of the closure 10 may tend to lift away from its contact on the underside thereof with the upper surface of the top of the container 12. In such a circumstance - which is also shown generally in Figure 2 - the annular rim 36 tends to interfere with the sides of the gasket 28 before the closure 10 is sufficiently deformed that the closure may be forced to move inwardly to the interior of the container 12. The height of the annular rim 36 is such that the top corner thereof tends to interfere with the edges of the gasket portion of closure 10, as aforesaid.

It will be noted that the gas-tight sealing engagement between portions of the lower and inner surfaces of the annular wall 56 of the tapping unit 48 are such as to preclude air inflow into the gas enclosure 52, and thereby so that oxidation or tainting of the flavour or other characteristics of the liquid within the container 12 may be precluded. In like manner, the seal between the edges 14 of the opening in the top of the container 12 into which the closure 10 is fitted, is such that escape of pressurized gas from the interior of the container 12 and inflow of air past the neck portion 22 of the closure 10 to the interior of the container 12, are precluded.

It should be noted that the source of pressurized gas which is external of the container 12 may be separate and apart

from the tapping unit 48, so that the diaphragm portion 30 of the closure 10 may only have to accommodate the tube 16. Otherwise, the diameter of the gasket portion 30 may have to be such as to accommodate the neck portion 46 of the tapping unit 48; and in any event, it has been noted that the material of the closure 10 is deformable and no material is removed from the closure when it is pierced or ruptured for purposes of passing the tube 16 into the interior of the container 12.

It should also be noted that it is convenient to have the diaphragm portion 30 recessed in the gasket portion 28 of the closure 10, so that its upper surface 38 lies below the upper surface 34 of the gasket portion 28 - and also so that its lower surface 40 lies above the lower surface 42 of the gasket portion 28 - and that when such conditions prevail, the diaphragm portion 30 is less likely to rupture or deform due to the action of gas pressure from within the interior of the container 12 when the container is otherwise sealed by the closure 10. However, the diaphragm portion 30 may be otherwise conveniently placed having regard to its thickness and the thickness of the gasket portion 28.

There has been described a closure for liquid containers which seals the liquid container in a gas and liquid-tight manner, and which may be pierced or puncture by a hollow tube inserted through a diaphragm portion thereof. The closure is made of a deformable material, such as rubber; and may be formed in different way than those which are precisely shown in the drawings but within the meaning and scope of the appended claims.

1. A closure for liquid containers from which the liquid therein is to be withdrawn through a hollow tube inserted into said container through said closure, when said liquid is acted against by gas pressure within said container and communicated thereto from a source of pressurized gas external to said container;

said closure being of a deformable material which may be pierced by said tube and which, when pierced with said tube extending therefrom, forms a substantially gas and liquid-tight seal around said tube;

said closure being adapted to be fitted into an opening in said container, and having a peripheral neck portion formed therein and dimensioned so as to form a substantially gas and liquid-tight seal between the closure and the edges of said opening;

said closure having

-- an upwardly extending channel formed in the underside thereof for communication with the interior of said container, said channel having an annular wall;

-- a gasket portion overlying said upwardly extending channel and having a diaphragm portion formed therein, said diaphragm portion being of lesser thickness than said gasket portion and with its upper surface recessed below the upper surface of said gasket portion;

-- a flange portion surrounding said gasket portion and below the upper surface thereof;

-- an annular upwardly extending rim formed on the upper surface of said flange portion;

the height of said annular rim being such that the top thereof tends to interfere with the edges of said gasket portion when said flange portion is turned upwardly at any place;

-- the diameter of said diaphragm portion being such as to accommodate the neck portion of a tapping device in which said tube is secured, the diameter of said upwardly extending channel being greater than the diameter of said neck portion of said tapping device.

2. The closure of Claim 1 where the under surface of said diaphragm portion is above the under surface of said gasket portion.

3. The closure of Claim 1 where said gasket portion forms a generally truncated cone above said flange portion and is surrounded thereby; and where said truncated cone is dimensioned to interfere with and be deformed by a downwardly extending annular wall spaced from and surrounding the upper portion of said neck portion of said tapping device so as to form a gas pressure chamber above said gasket portion and within the area defined by said annular wall of said tapping device.

4. The apparatus of Claim 3 where a slit is formed in said neck portion of said tapping device and gas pressure communication is realized through said slit from said gas pressure chamber to the interior of said container.

5. The closure of Claims 1, 3 and 4, where said material is rubber.

IMPR-

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Box for cheese - top, including an opening, is covered with a plastic film

IMPRESSIONS P BURIOT 14.06.73-FR-022375

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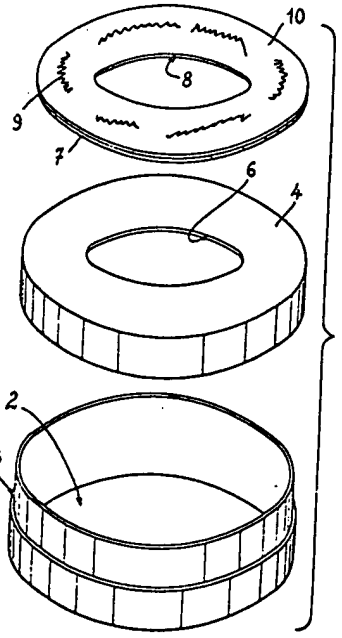
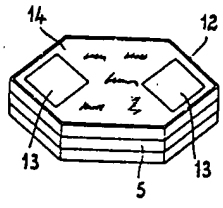
A packaging box for cheese has a bottom portion and a top which overlaps with this, the joint being sealed with an adhesive band. The top has an opening so that the prodt. may be seen. This is covered with a label which also has an opening, to which a transparent film is stuck, this covering the label and the opening. The transparent film is pref. of polyethylene, PVC, or cellulose acetate. This arrangement allows traditional machines to be used which allows the adhesive band to be applied, which is difficult if the film covers the whole box. 14. 6. 73 as 022375. (5pp.)





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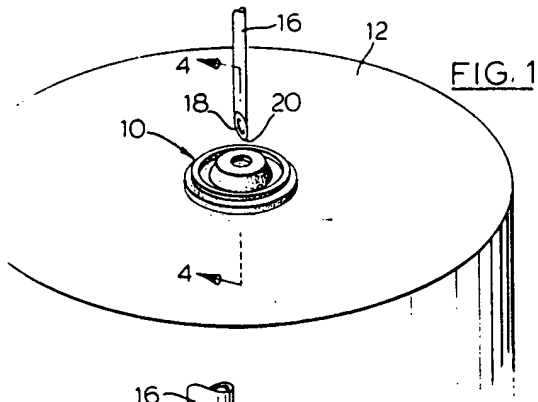

FIG. 1

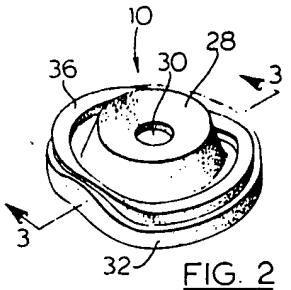

FIG. 2

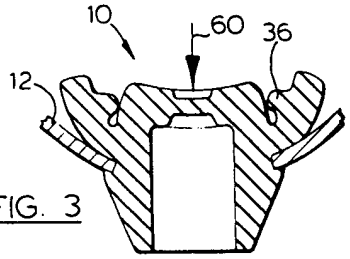

FIG. 3

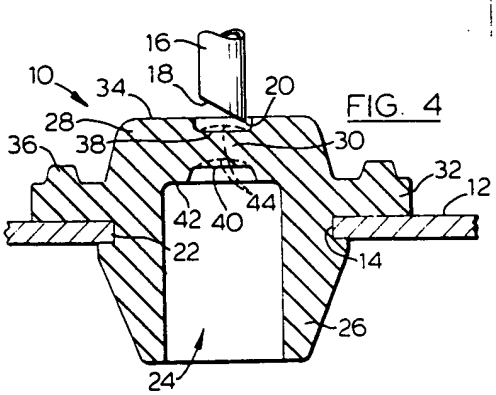

FIG. 4

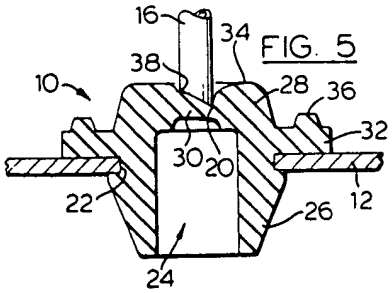

FIG. 5

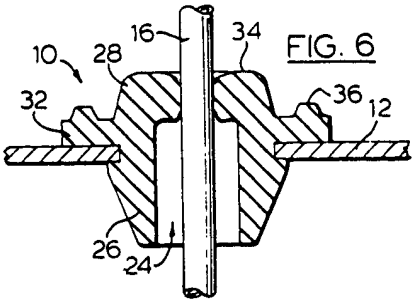

FIG. 6

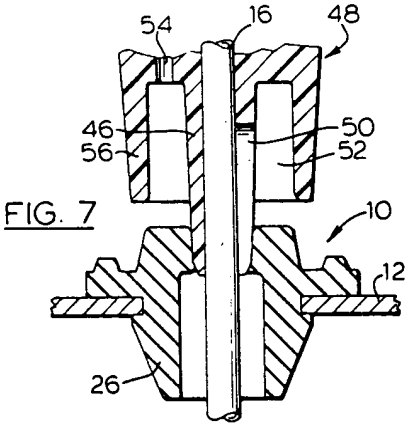

FIG. 7

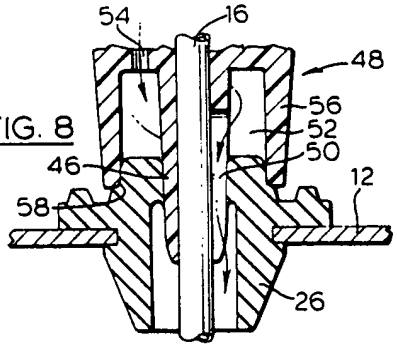

FIG. 8